Scholar Publishing Group
International Journal of Educational Innovation and Science
https://doi.org/10.38007/IJEIS.2021.020103
ISSN 2789-7184 Vol. 2, Issue 1: 15-23

Deep Integration of Innovation and Entrepreneurship Education and Physics Education

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Keywords: Innovation and Entrepreneurship, Professional Education, Curriculum System, Deep Integration

Abstract: With the launch of the "Study of College Students' Innovation and Entrepreneurship Training" and other construction projects, innovation and entrepreneurship education has become a hot issue in current university education research. On the basis of years of teaching practice in physics, aiming at improving the ability of college students to innovate and create, they share the teaching resources of various professions. This paper discusses the exploration and practical experience of the new applied physics major in the past six years from the aspects of professional construction, talent training objectives and training program determination, curriculum system reform and practical teaching construction. It is proposed that the new application major should focus on strengthening the curriculum system construction. Pay attention to the cultivation of students' practical and innovative abilities, so as to better ensure the deep integration of innovation and entrepreneurship education and physics.

1. Introduction

Looking at the history of China's higher education reform, it is not difficult to see that at the beginning of the founding of New China, China's higher education borrowed from the "specialist education" thought of the former Soviet Union, and emphasized the establishment of professional and talents according to the plan, forming a so-called "specialist education" mode. Later, it was found that "specialist education" overemphasized "learning to use", which led to a narrower professional discipline, students' basic theoretical knowledge is not wide, cultural quality is not high, social adaptability is poor, and innovation ability is not strong. After the reform and opening up, it draws on the "general education" of western developed countries, emphasizes the cultivation of students' ability to adapt to the society, and conducts "general education" for college students. However, with the advent of the information age, people find that the contradiction between

knowledge increment and learning time constant is prominent, and the "general education" model is limited. Therefore, how to integrate "specialist education" and "general education" to form an educational model suitable for Chinese characteristics, and to cultivate high-quality, high-ability and innovative talents is the focus of current education reform.

2. Determining the Goal and Orientation of Innovative Talent Training

The curriculum system is the main carrier and direct way to achieve the goal of talent training, and is a series of courses established to achieve the goal of talent training. To determine what kind of talent training objectives, it is necessary to determine what kind of corresponding curriculum system. Whether it is the establishment of a talent training goal or the establishment of a curriculum system, it must be guided by market demand and employment, and be based on competency, so that it is in line with the diversified career choices and social diversification of students. Each student is a different independent individual, with different values, interests and social ambitions. He must focus on individual development on the basis of comprehensive development. It is necessary to focus on the application-oriented talent training objectives, learn from the curriculum experience of domestic and foreign universities, and reorganize and reform the curriculum system according to the principle of “wide calibre, thick foundation, individuality and ability” to reorganize and reform the curriculum system, build a five-module curriculum system that breaks the boundaries of disciplines, strengthens the integration of disciplines, and emphasizes practical ability. It consists of general education courses, professional foundation courses, professional direction courses, professional development courses, and professional practice courses. In addition, depending on the nature of the course and the way it is studied, the course section is divided into compulsory and elective courses, of which elective courses must also include restricted courses and optional courses.

From the perspective of the ability of talent cultivation, the general culture curriculum is mainly to improve the overall quality of students, so that students form a correct outlook on life and values, and have the basic qualities of high-quality talents. It generally includes courses in thought and politics, tools and methods, sports and health, and quality courses. It is usually offered in the form of compulsory and optional training. The professional basic course is mainly to strengthen the training of students' basic theories and methods of physics, basic knowledge and skills, so that students can master solid professional knowledge. It mainly includes general physics, theoretical physics, advanced mathematics, mathematical physics methods, electronic circuits and other related courses, usually in the form of compulsory.

The professional orientation course is to train the students' basic professional qualities and basic skills after determining the professional direction. Its professional direction courses must be offered in compulsory forms and limited editions. The professional development course refers to the course that is completed after the completion of the professional direction course. It is usually offered in the form of limited electives, mainly to further expand the depth and breadth of the professional direction knowledge. The professional practice course is mainly to cultivate students' hands-on operation and practical application ability. It is usually offered in the form of compulsory and optional training, usually including physics experiment series courses, educational practice and practice courses, scientific paper writing and literature review courses, career planning and entrepreneurship courses, graduation design and other courses. In different directions, the practical courses offered by them are not exactly the same. In general, the curriculum system should reflect the transformation from “knowledge-based” to “capability-oriented”, from “discipline-based” to

“education-oriented” educational philosophy, breaking the traditional teaching plan that emphasizes the systemic and complete shackles of knowledge, and realizes the organic combination of professional knowledge training, ability training and personality training.

3. In-Depth Integration of Innovative Entrepreneurship Education and Professional Curriculum Content

3.1. Construct A Deep Integration Curriculum System of "Two-Way Integration of Theoretical and Practical Courses, Multi-Directional Selection"

According to the training goal of innovative and entrepreneurial talents, the curriculum system of "the combination of theory, practice curriculum and innovation and entrepreneurship education curriculum and multi-directional selection" is constructed. In the process of teaching, step by step, gradually integrate into the teaching content of innovation and entrepreneurship education, and achieve the cultivation of employment skills and innovation and entrepreneurship.

3.2. The Construction of Innovative Entrepreneurship Curriculum System

According to the training objectives, the innovation and entrepreneurship education curriculum is integrated into the professional curriculum system to build a curriculum system for innovation and entrepreneurship education in physics. The innovative entrepreneurship curriculum is divided into a theoretical course module and a practical course module, which are respectively integrated into the four-year professional study. The theoretical course module mainly teaches the basic knowledge of innovation and entrepreneurship - special seminar - skill training - simulation actual combat, the practice course module is mainly to carry out the practical activities of students' innovation and entrepreneurship, including the comprehensive practical skills training in the class. Enter the practice base of college students to carry out training on innovation and entrepreneurship projects, carry out innovation and entrepreneurship practice activities, participate in various competitions for college students' innovation and entrepreneurship activities, and carry out innovation and entrepreneurship practice. Through the combination of the theoretical course module and the practical course module, the in-class link and the extra-curricular link, the curriculum of innovation and entrepreneurship education is revised and perfected, and it is integrated into the professional curriculum system.

3.3. Establish a Group of Courses Related To Innovative Entrepreneurship Education

For students majoring in science and engineering, they are not involved in the basic courses of humanities and social sciences in professional courses. In order to help students learn innovative entrepreneurial knowledge in basic theory, it is recommended to set up compulsory courses related to innovation and entrepreneurship education in the public course module. To popularize the basic knowledge of entrepreneurial theory and business methods, so that students can understand the meaning of innovation and entrepreneurship. In the professional elective course, it is allowed to choose elective courses such as marketing and e-commerce across the profession to realize credit sharing. In interdisciplinary professional knowledge learning, students master the subject knowledge and methods of innovation and entrepreneurship, guide students to discover problems in the profession, and carry out innovative and entrepreneurial practice activities to improve students' ability to discover, analyze and solve problems.

4. In-Depth Integration of Innovation and Entrepreneurship Education and Practical Education in Physics

4.1. Optimize the Curriculum System and Increase the Practical Teaching Links

The direction of the transformation and development of colleges and universities is to cultivate high-level applied technical talents with solid foundation, good professional ethics and humanistic qualities, and strong sense of innovation and practical ability. In the traditional practice teaching, most of the course experiments are conducted by teachers in the classroom to demonstrate the experimental principles and demonstrate the experimental process of verification experiments, unable to mobilize students to learn independently, active thinking, independent experiments and positive innovation. Course internships and graduation internships are often subject to constraints by the internship unit. Therefore, the new curriculum system should change the mode of “emphasize theory and light practice” in the past teaching, increase the practical teaching course in the curriculum setting, add more practical links, encourage students to participate in various scientific and technological innovation activities and professional skills competition. At the same time, through the establishment of cooperation with primary and secondary schools and enterprises, the actual participation rate and internship effect of students' professional internships will be improved.

4.2. Reform Teaching Content, Methods and Assessment Methods to Enhance Innovation Ability

The fundamental purpose of practical teaching is to apply what you have learned, and to master the job skills required by the industry through four years of study. In the current practice teaching, there is a case where a teaching material and an experimental project are not updated all the year round. The practical teaching is teaching-led teaching, and it is difficult to mobilize students' learning initiative and innovation ability. Therefore, the cultivation of innovative talents should focus on the combination of theoretical education and practical education. The core objectives of high-quality innovative talent training can be carried out to reform the following teaching contents, methods and assessment methods.

(1) Reform the content of practical teaching, refine the experimental part of the basic course, cancel part of the verification experiment, strengthen comprehensive and design experiments, and cultivate students' practical ability and innovative ability. In the comprehensive and design experiments, the compulsory experiment is appropriately reduced to increase the elective experiment, so that students can freely choose experiments according to their interests and abilities, and pay attention to the development of individuality and innovation ability. In order to achieve the goal of training innovative talents, the experiment and practice of electronic courses (such as electronic technology course design training, single-chip principle application experiment, computer-aided physics teaching experiment, physical numerical simulation experiment, etc.) should be appropriately added. Combine research with teaching, let students understand the cutting-edge dynamics related to the curriculum, and introduce the latest achievements into practical teaching, such as the opening of "Material Physics", "Astrophysics" and "High Energy Physics".

(2) Reforming the traditional teaching method of teacher explanation and demonstration, students repeating experiments, creating online on-line courses, students to prepare in advance and review after class, learning is no longer limited by time and space, teachers and students, students

and students can exchange discussions at any time. More time is left in the classroom for practical operation and discussion of problems in the experiment, highlighting the learning subject position, cultivating students' ability to find problems, analyze problems and solve problems in practice, and improving students' innovative practice ability.

(3) Reforming the traditional test method based on the final test, formulating an appraisal outline that meets the requirements for innovative talent training and professional characteristics, truly reflects the mastery of students' comprehensive knowledge and skills, the ability to analyze and solve problems, and develop innovative talents with application and innovation capabilities.

(4)Classification algorithm of innovation and entrepreneurship education resources based on naive Bayesian network algorithm

Massive innovation and entrepreneurship education resources are still growing exponentially, and the types are numerous and complicated, and they lack effective organization and management. How to effectively sort and classify the innovation and entrepreneurship teaching resources in the Internet is an important problem that we urgently need to solve now. In view of the features of automatic text categorization, such as saving labor cost, fast categorization, and high accuracy, we regard it as the main method of categorizing innovation and entrepreneurship teaching resources. Naïve Bayes classification algorithm is a statistical classification algorithm based on Bayes' theorem.

Assuming the occurrence probability of all texts and the occurrence probability of each feature item are independent of each other, the calculation formula is as follows.

$$P(D \mid C_j) = \prod P(W_k \mid C_j) \tag{1}$$

Since P(D) is a constant for any category, the formula can be simplified to：

$$P(C_j \mid D) = P(C_j)\ P(D \mid C_i) \tag{2}$$

Among them, $P(C_i)$ is easy to find and is equal to the number of texts in the C_i categories/total texts. The focus of the algorithm is how to find $P(D \mid C_i)$. We use the assumption that the feature items are mutually independent and find it by the following formula:

$$P(D \mid C_i) = \prod_{j=1}^{k} P(W_j \mid C_i) \tag{3}$$

4.3.Strengthen Platform Construction and Expand Training Space

Due to problems such as system and funding, colleges and universities often make the equipment and places for practical teaching unable to meet the needs of an increasing number of students and increased training courses. The lack of equipment and places for practical teaching leads to the practice of students' practical courses. It is difficult to apply the basic theory to practice. The college has taken several effective measures to expand the practical teaching platform inside and outside the school.

(1) Increase capital budget and investment, and strengthen the renewal and construction of the physical basic experimental platform;

(2) Establish basic experiments, professional comprehensive experiments, teacher education practice training and comprehensive design experimental centers and advanced materials centers for students to conduct extracurricular innovation experiments;

(3) Strengthen the integration and resource sharing of the experimental platform in the school,

and cooperate with the School of Chemical Engineering, the College of Biology, and the Analytical Testing Center to effectively utilize existing resources;

(4) An agreement is reached with primary and secondary schools and enterprises through the form of school-enterprise cooperation, providing students with a platform for professional knowledge and skills training by visiting internships or internships.

4.4. Investigation and Research on the Deep Integration of Innovation and Entrepreneurship Education and Physics Practice Education

1) Research purpose

The purpose of this research is to investigate the current integration of innovation and entrepreneurship education and physics practice education in colleges and universities, through the establishment of experimental and control classes, that is, the combination of innovative and entrepreneurial education thinking in the physics curriculum of Class A, and the traditional curriculum for group B, which has two teaching methods.

2) Research methods

(1) Questionnaire survey

A questionnaire survey was conducted for the experimental class and the control class. There were 2 questions in the questionnaire. The two aspects of students' interest in physics learning and the innovative consciousness of physics practice were investigated. The effectively recovered questionnaires were 52 for class A and 52 for class B.

3) Data analysis and processing

This study uses EXCEL and SPSS for data analysis and processing. In the process of processing and analysis, independent sample T test, one-way analysis of variance, correlation analysis, and mediating effect test are used.

4.5. Data Analysis of In-Depth Integration of Innovation and Entrepreneurship Education and Physics Practice Education

1) Course expectation level

According to the survey data in Table 1 "Are you looking forward to taking physics class?", as shown in Table 1, 69.23% of the students in Class A chose "Extremely Looking forward", while only 46.15% of Class B chose "Extremely Anticipated".

Table 1. Data of students' expectations for physics class

	Class A		Class B	
	Frequency	Percentage	Frequency	Percentage
Looking forward to	36	69.23%	24	46.15%
General	14	26.92%	25	48.08%
Do not expect	2	3.85%	3	5.77%

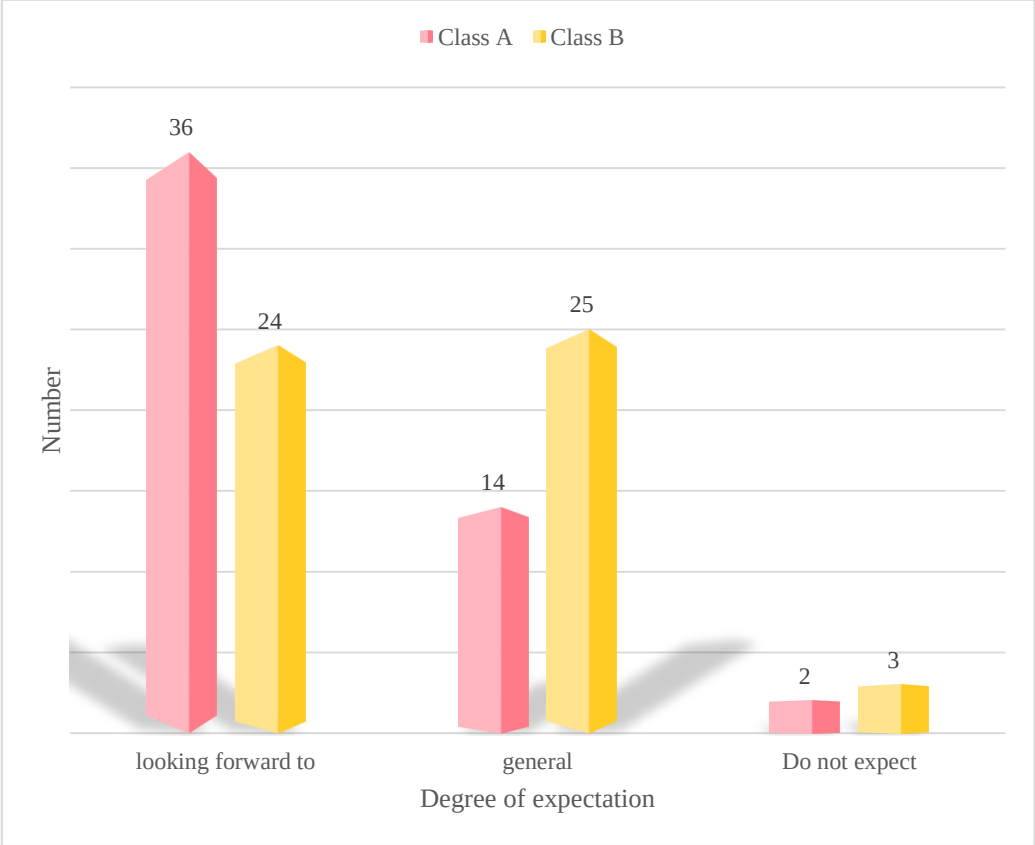

Figure 1. Data of students' expectations for physics class

It can be seen from Figure 1 that there are only 2 students in Class A who do not expect physics classes, and 3 students in Class B answered that they do not expect physics classes. It can be seen that the integration of innovative and entrepreneurial education thinking into physics practice teaching can make students more interested in learning physics, so that they look forward to taking physics classes.

2) Innovative consciousness of physics practice

In the questionnaire of this study, the survey of students “when they encounter problems they don’t understand, they will take the initiative to find materials to do experiments to find answers”, as shown in Table 2: 63.46% of class A students choose “Yes”, and only 38.46% of class B chose "Yes".

Table 2. Survey data of physical practice innovation awareness

	Class A		Class B	
	Frequency	Percentage	Frequency	Percentage
NO	1	1.92	3	5.77
Occasionally	18	34.62	29	55.77
YES	33	63.46	20	38.46

It can be seen from Figure 2 that after a period of innovation and entrepreneurship teaching, the physics practice and innovation consciousness of class A students have been strengthened, and they

can more actively seek answers to the problems encountered in learning, and show greater awareness of physics practice.

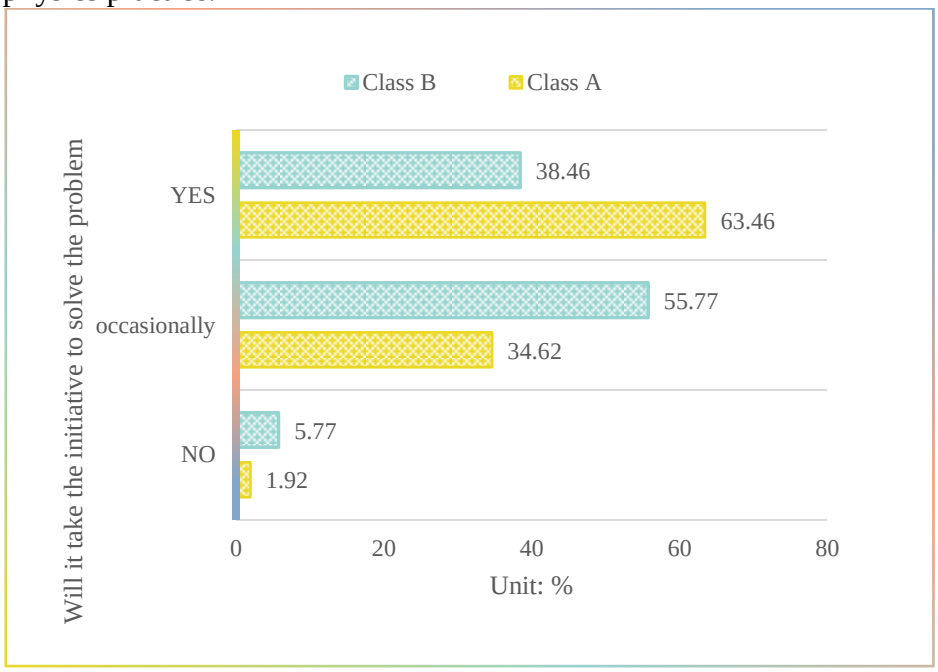

Figure 2. Survey data of physical practice innovation awareness

5. Summary

Through the construction of the deep integration system of innovative entrepreneurship education and professional education, the teaching concept and teaching methods have been changed, the cultivation of practical teaching and innovation consciousness has been highlighted, and the teaching concept of students as the main body has been highlighted. Through the study of the basic courses of innovation and entrepreneurship education, students master the basic knowledge of innovation and entrepreneurship, and integrate innovation and entrepreneurship education into professional courses and professional practice teaching through cross-disciplinary course selection, combined with practical activities in and outside the class and guidance of various competitions. To enhance the cultivation of innovation and entrepreneurship, and realize the teaching mode of integration of practice innovation and professional practice education, so as to construct a new system of integration of theory and application, research and application, teaching and innovation and entrepreneurship, and enhance the practical innovation ability, employment competitiveness and sustainable development potential of students.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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